



BPA Technology Innovation

A disciplined approach to research portfolio management that leads to BPA applications that deliver value, reduce costs or increase revenues, and maintain low rates and reliable power for the region.

Agenda

- Results
- R&D Fundamentals
- Technology Innovation Structure
- Portfolio & Project Management
- Conclusion

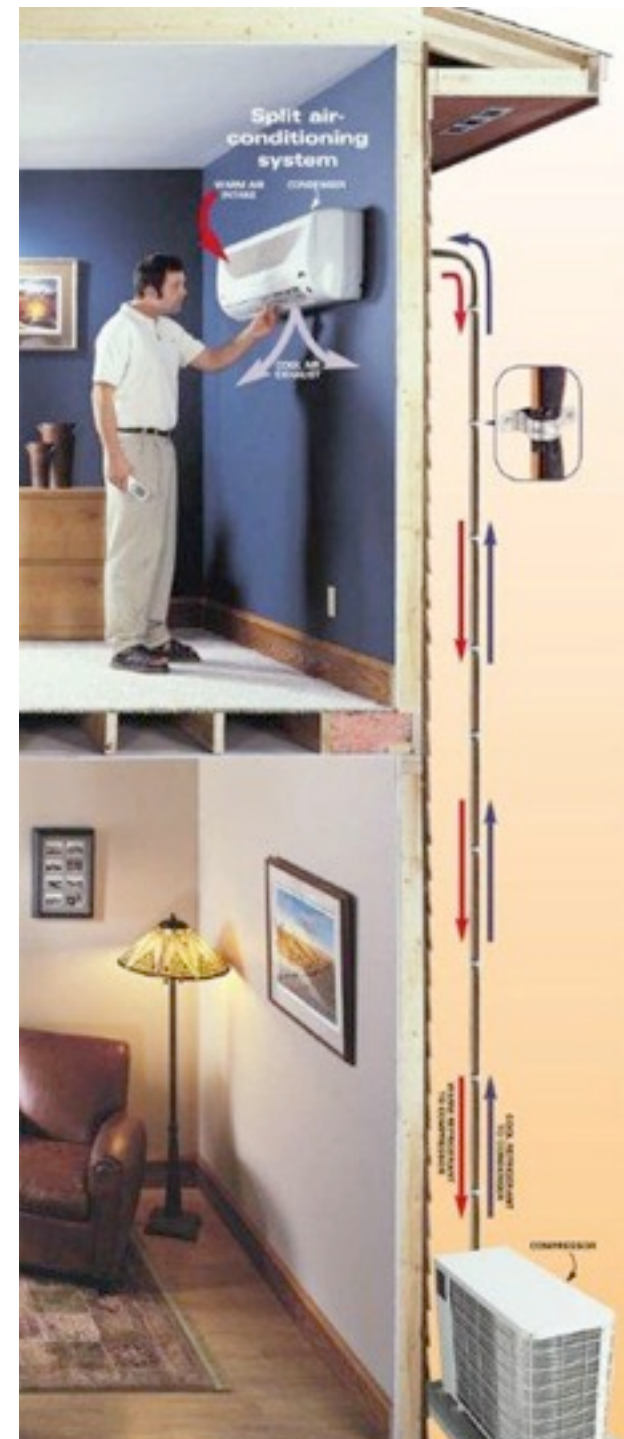
BPA Results



Ductless Heat Pumps

- Heat Pump technology assessment capability
- Installed more than 4,800 ductless heat pumps into homes in the Pacific Northwest
- Success resulted in expansion of program for small business applications
- Provides future savings to BPA

Value Delivered =
\$Millions in Least Cost Energy



Seismic

- Reduce the seismic acceleration by: 50% for 500 kV equipment; 30% for 230 kV and 115 kV equipment & 10% for 69 kV equipment
- Created tools for equipment designers to validate models of seismic mechanics & perform representative analysis and design approach



Value Delivered = \$000 Millions Faster System Restoration

Conductor Shunt



- 20 mile Ross-Lexington upgrade
- Increased capacity with “splice shunts” instead of new wire
- Half outage time
- One BPA crew vs. multiple
- \$4 million direct savings first application
- Multiple applications in progress and pending

Value Delivered = \$Millions in First Cost Savings

Synchrophasors

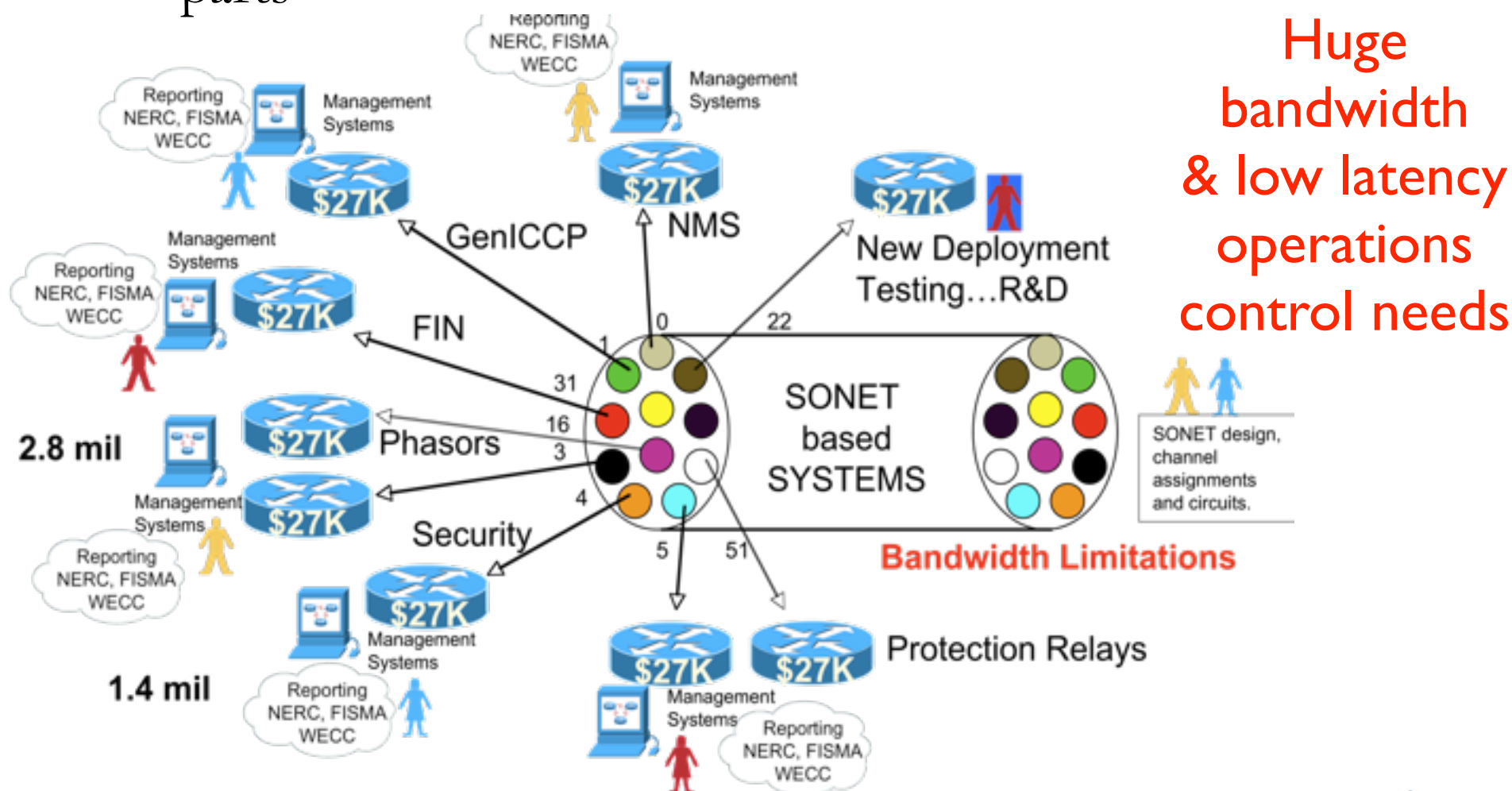
- SCADA @ BPA = 2 seconds
- Synchrophasors = 60 / second (120 times faster)
- Now - sleuth grid issues (looking backward)
- Soon - control functions for reliability
- Mid-term - oscillation damping
- Long-term - additional Pacific Intertie throughput



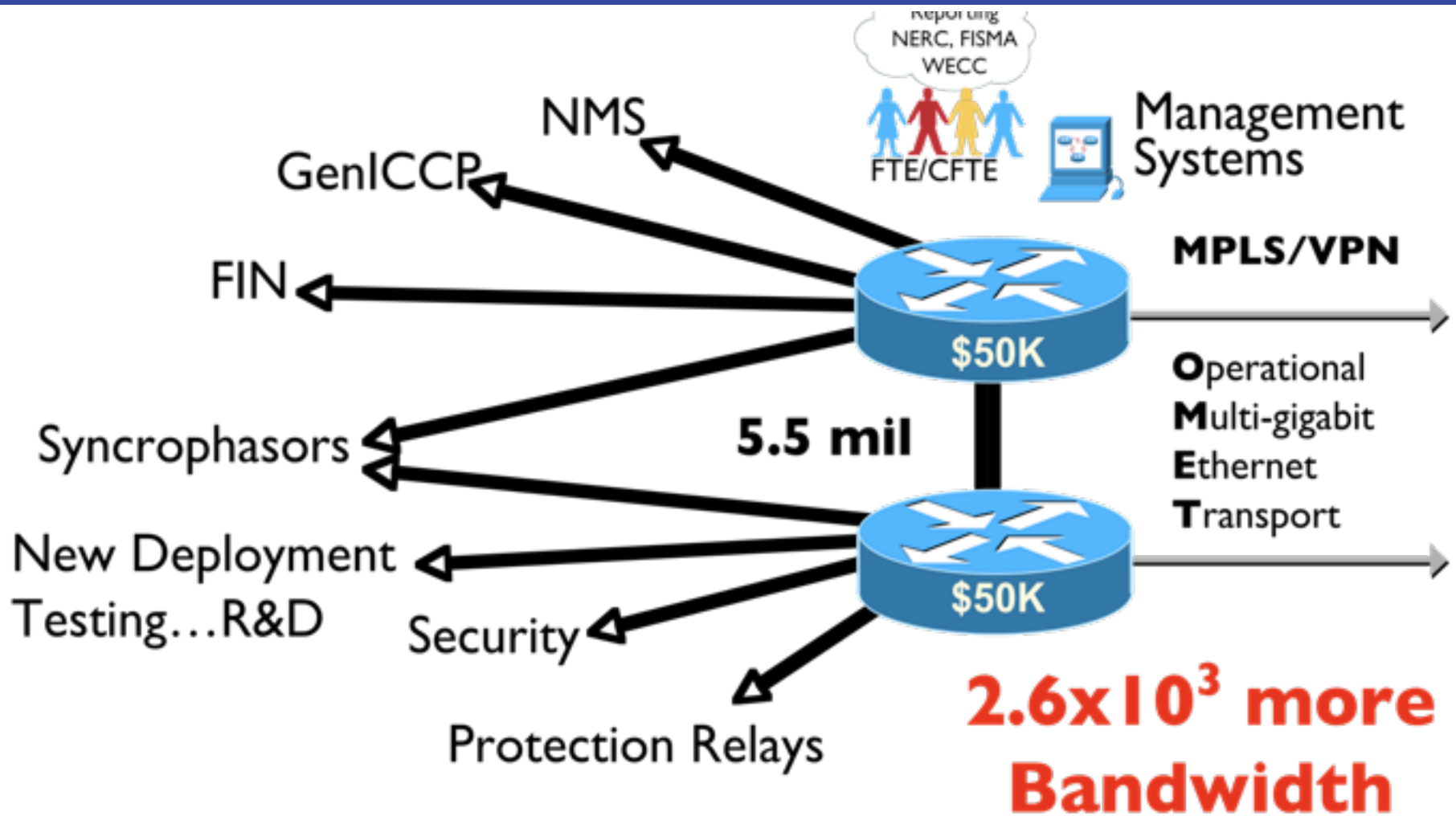
Value Potential = \$000 Millions in Additional Revenue

Operations Telecommunications

- Used for SCADA, etc
- Needs to be used for smart grid, synchrophasors, etc
- Current technology reliable but low bandwidth and many parts



Multi-Gigabit Ethernet Transport for Operations

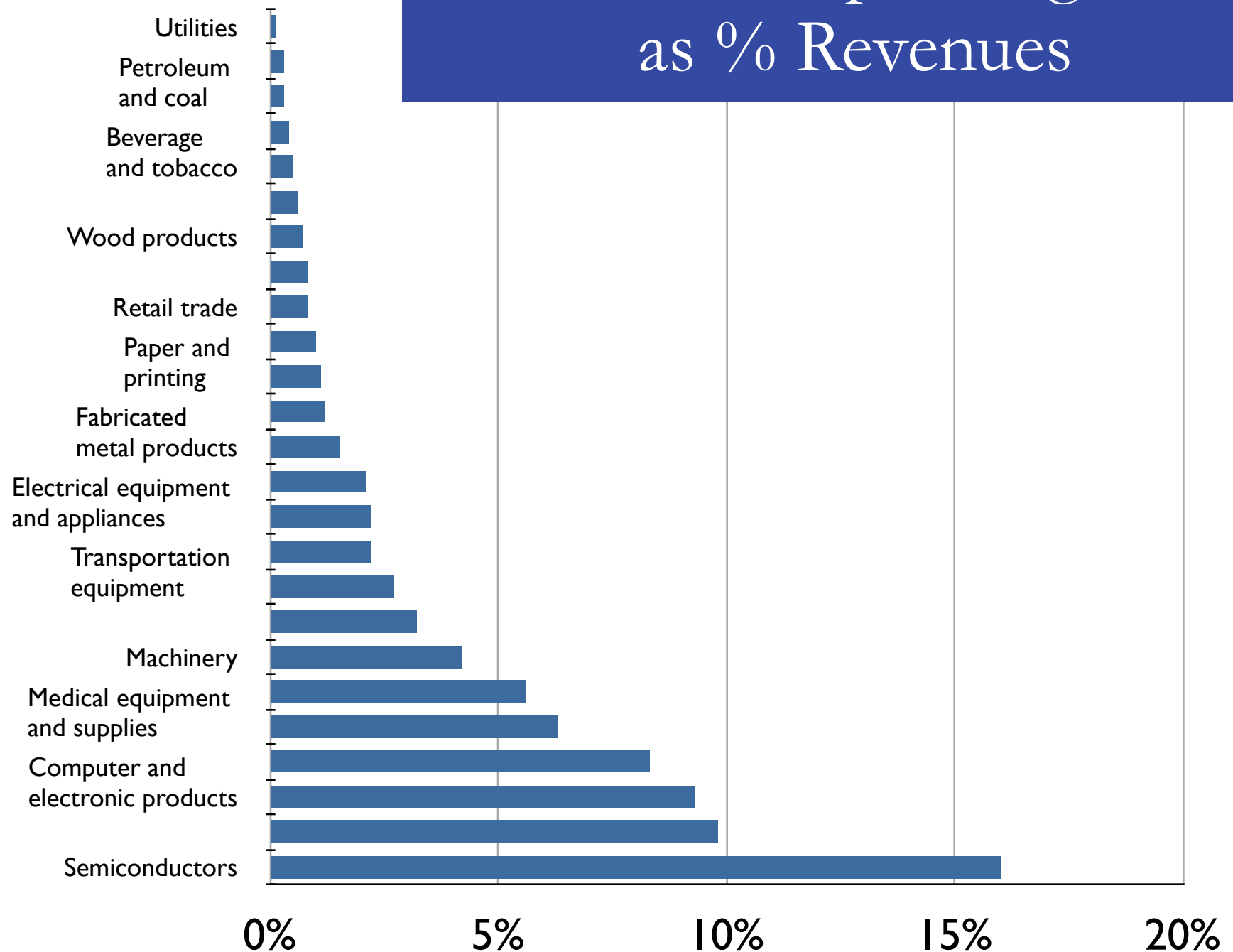


Value Delivered = \$Millions in First Cost;
multiples of that for operations savings
Plus critical bandwidth

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R&D Spending as % Revenues



What's Wrong with Spending 0.01%?

- Power sector “owns” about 40% of climate change issues
 - **R&D needs:** CO² sequestration, energy efficiency, effective renewables and storage integration, & smart grid
- Power sector could “own” another 30% related to transportation (electric vehicles)
- Utterly new and more complicated grid operations coming – Wind + Smart Grid

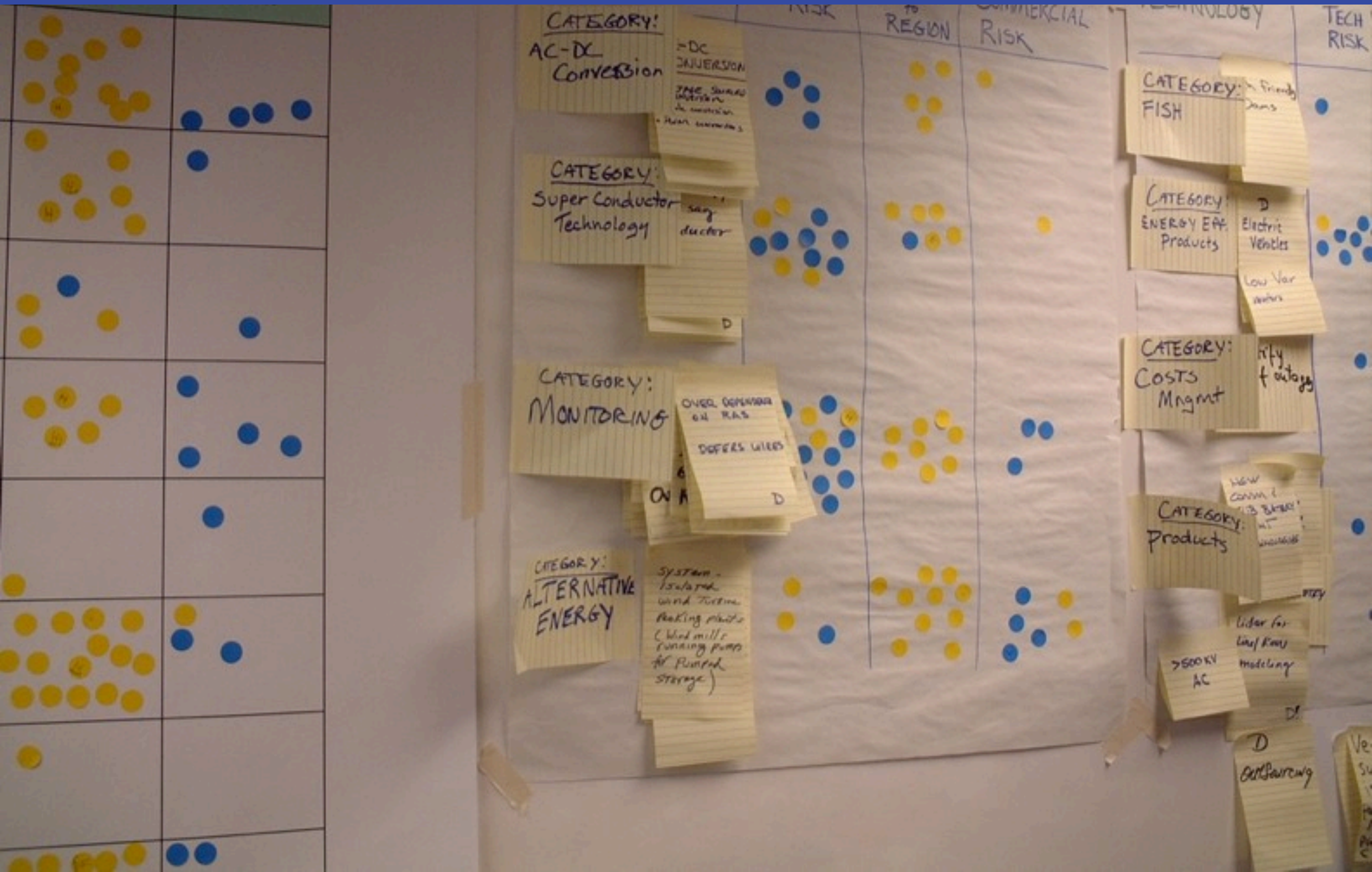
Good R&D Practices

- Publicly articulated research interests and agenda (www.bpa.gov/ti)
- Portfolio concept across key dimensions
- Great project management including built-in kill decision points
- In-company integration addressing business needs

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BPA's Version



Strategically Driven

B O N N E V I L L E P O W E R A D M I N I S T R A T I O N



Agency Strategy I5

Technology Innovation

Agency Strategy Map Technology Innovation-I5

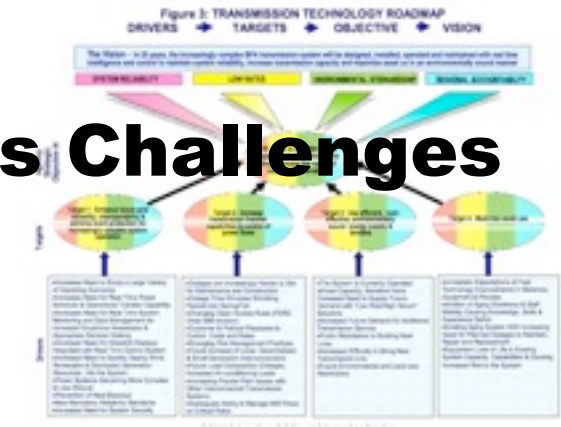
BPA solves business challenges and enables breakthroughs using a program of disciplined research and technology innovation that is recognized to deliver high value to the region

Direct Linkages

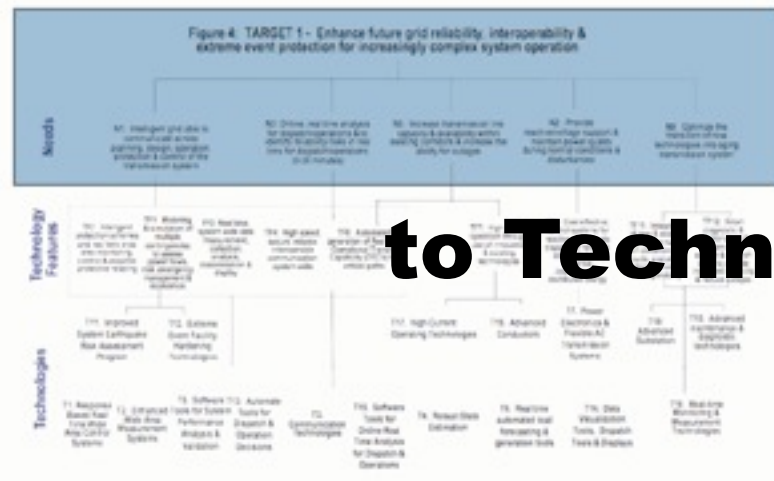
BPA Strategy



to Business Challenges



to Technologies

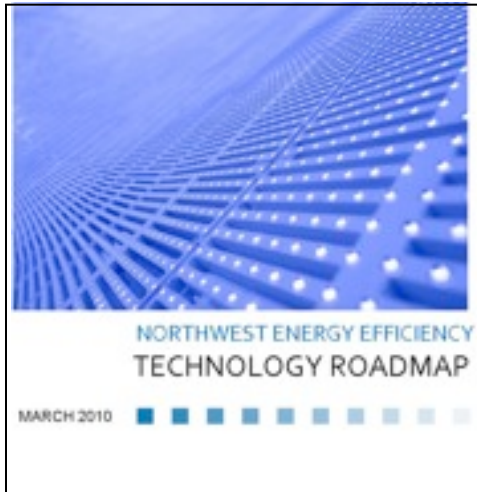


to Research Portfolio



Technology Roadmaps Guide the Initiative

Explicit Linkages to Business
Challenges



Physical Security Technology Road Map February 2007



*The Enigma was a portable cipher machine
used to encrypt and decrypt secret
messages*

Power services TECHNOLOGY ROAD MAP March 2008



Hungry Horse Dam

**Research is to see what everybody
else has seen, and to think what
nobody else has thought.**
- Albert Szent-Gyorgyi

Transmission TECHNOLOGY ROAD MAP September 2006



1885 Generator
At first glance one may think,
"My how things have changed,"
But at second glance one may admit,
"Things haven't changed much at all."

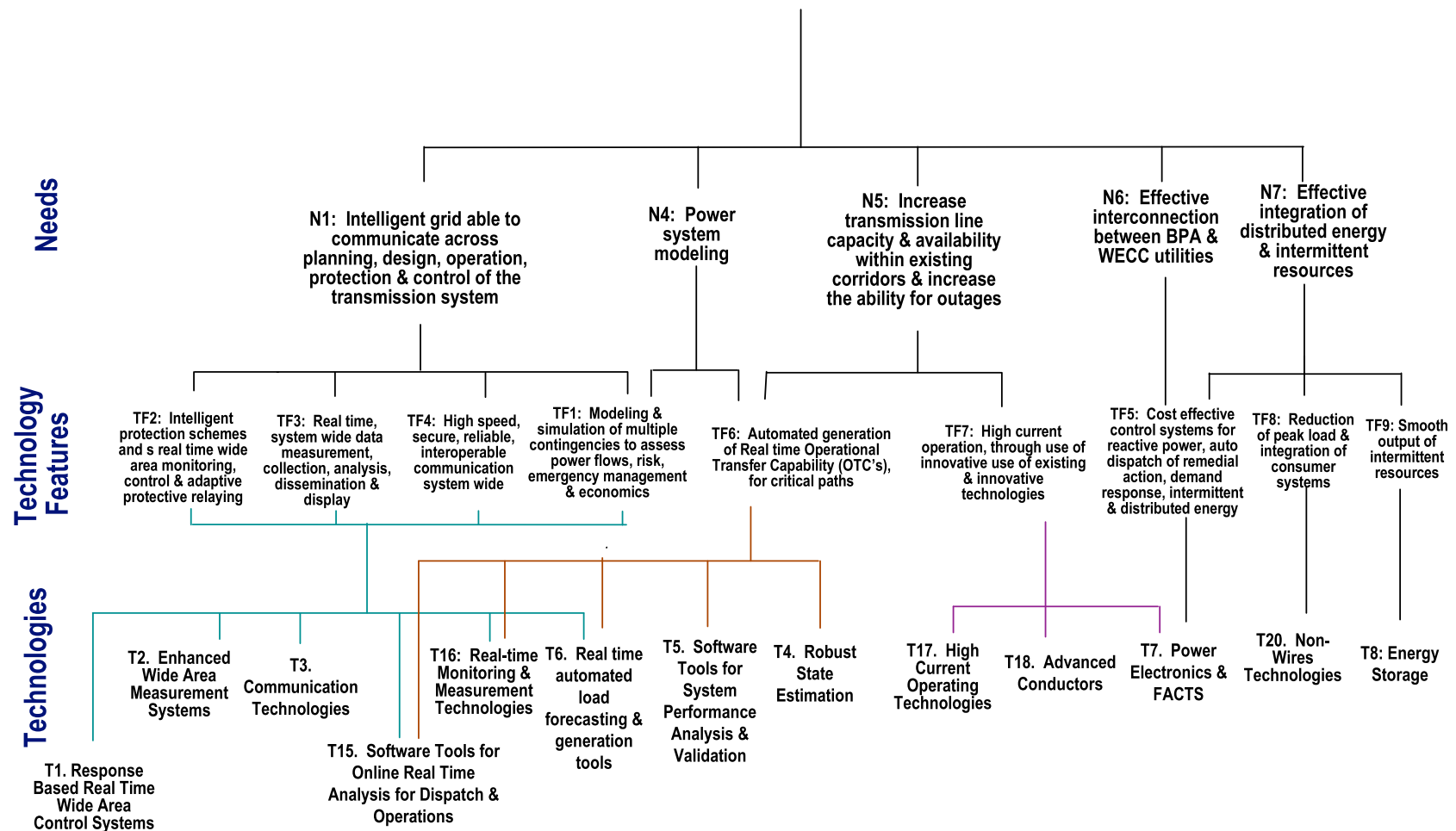
Renewable Energy Technology Road Map (Wind, Ocean Wave, In-Stream Tidal & Solar Photovoltaic)



September 2006

Transmission Roadmap Target

Figure 5: TARGET 2 - Increase transmission transfer capabilities & control of power flows



Technology Innovation Council

Dave Armstrong, Deputy Adm

Larry Bekkedahl, VP Tx Eng

Kathy Black, Legal Council

Allen Burns, VP, Bulk Marketing

Larry Buttress, VP IT, CIO

Jack Callahan, Energy Efficiency

Scott Coe, VP Req Markets

Anita Decker, Chief Op Officer

Greg Delwiche, SVP Pwr Svcs

John Haner, Tx Plan

Jeff Hildreth, Labs

Mark Jones, Hydro

Elliot Mainzer, EVP Strategy

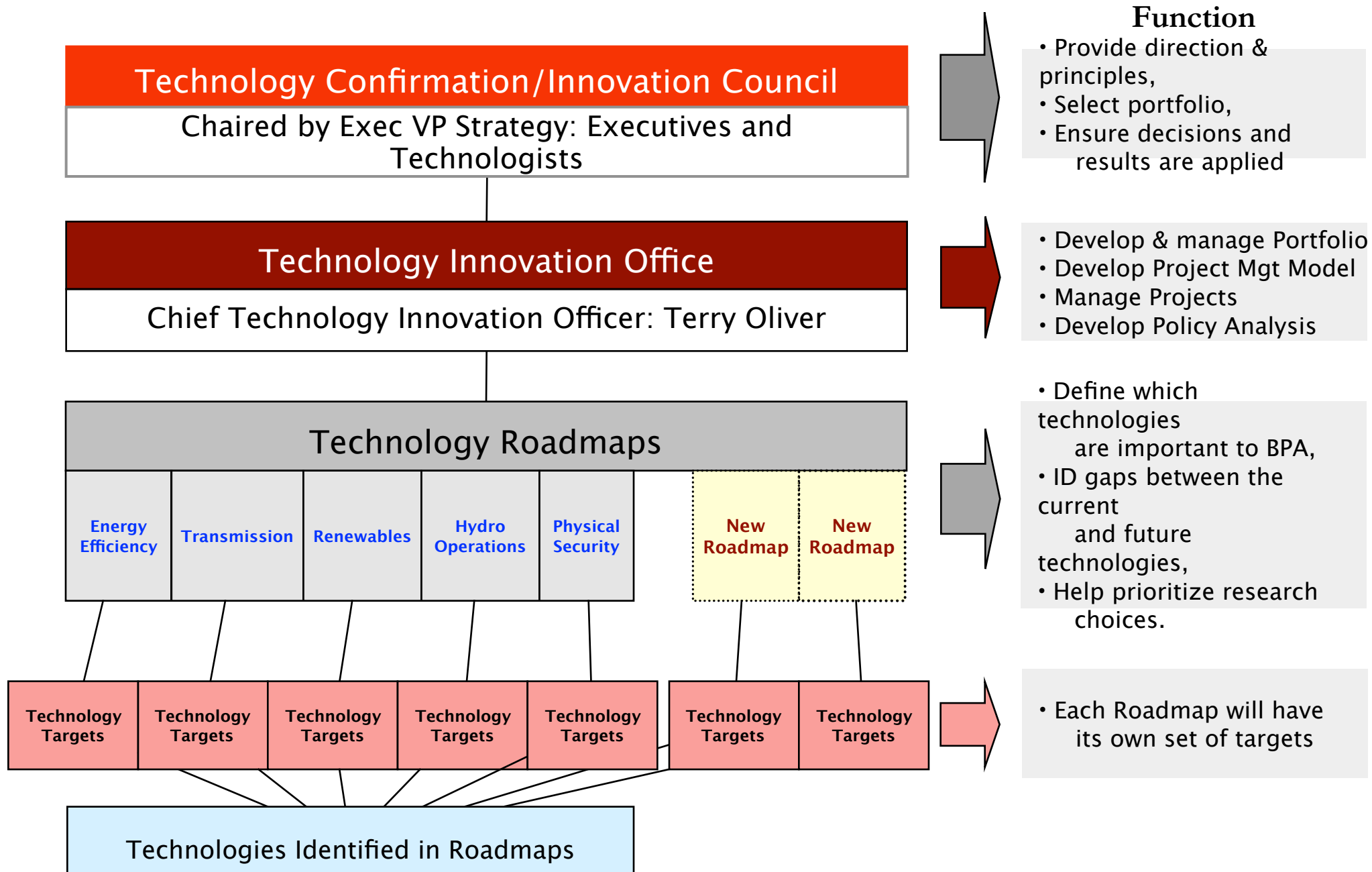
Terry Oliver, Chief TI Officer

Peter Raschio, Tx Tech Ops

Don Watkins, Tx WECC NERC

Executives & Experts – Paneled as Peers

Technology Innovation Council



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Buckets

BPA Role in
Technology
Development

BPA
Leads

EPRI,
CEATI

Active
Assess

Watch/
Pass

Balancing
Portfolio
Issues

Break-
through

In-
crement

Reserve
External

Urgency

Trade-Off

R&D Investment
Effectiveness

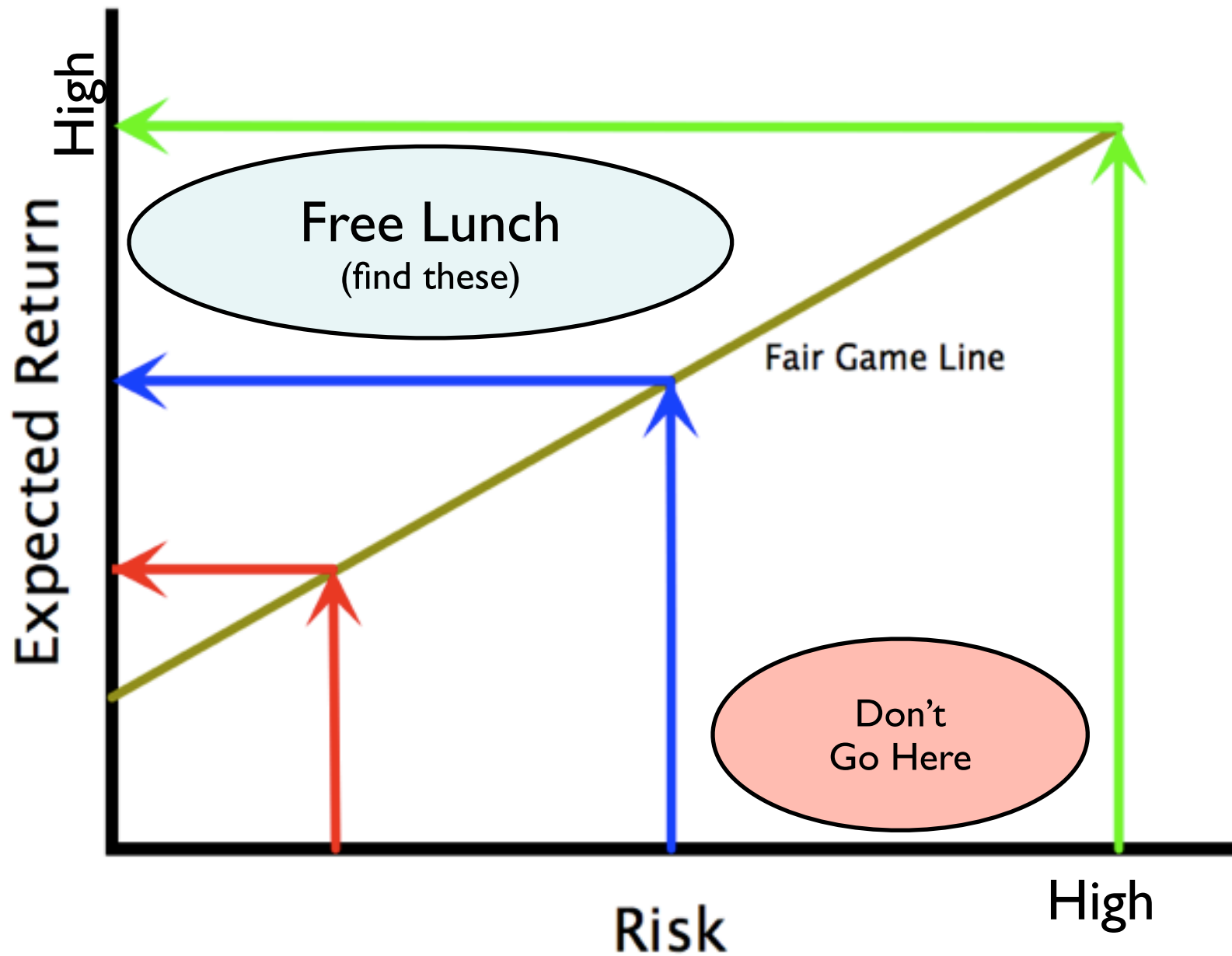
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PMO

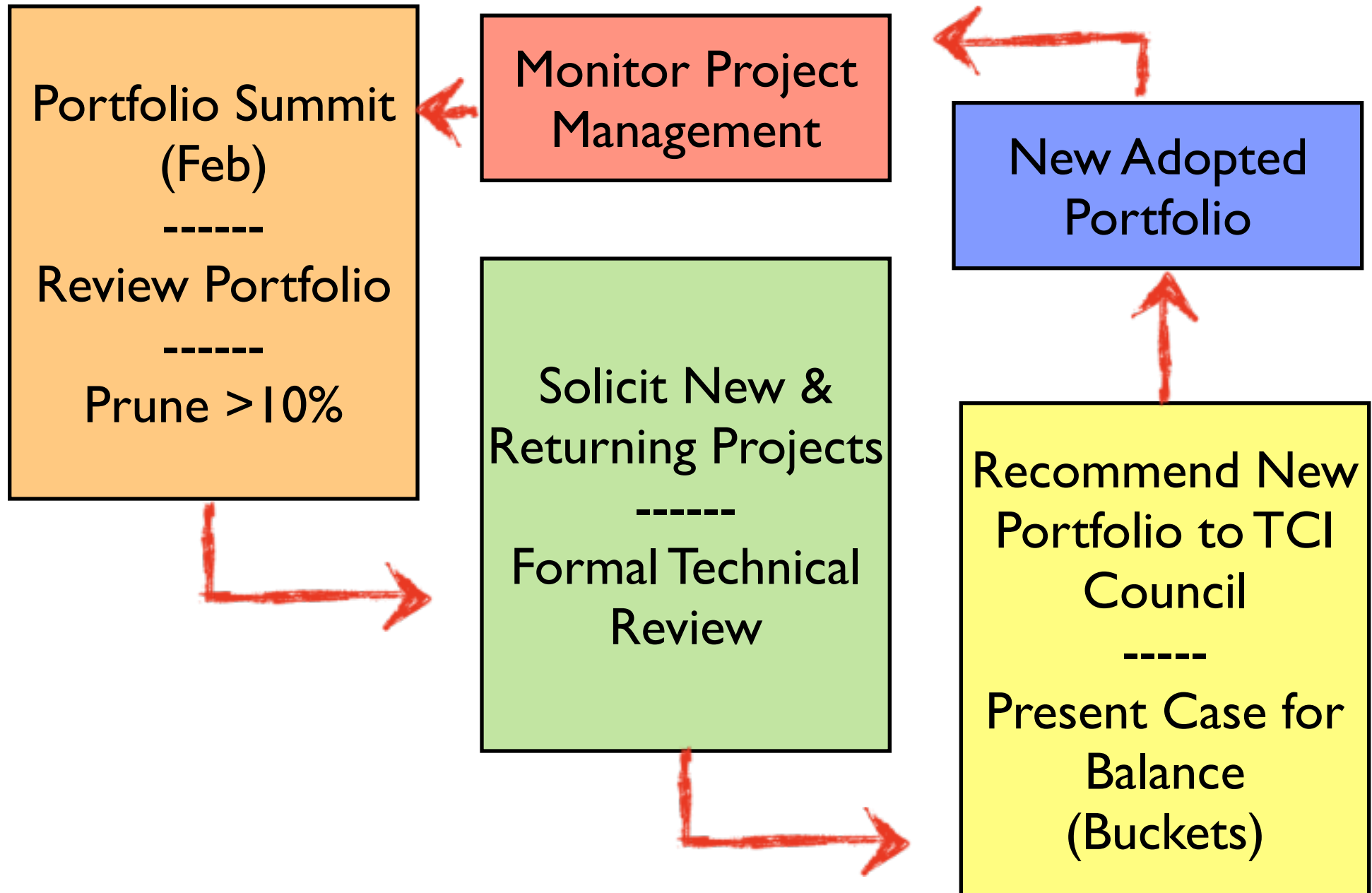
Annual
Review

Built-in
Kill

Risk v Reward



Cycles



Project Management

RESEARCH PROJECTS WILL FAIL



Provisions for Great Project Management

- Project Management
 - TI Project Management Officer – 1 of 3 in BPA
 - Requirements, training, maturity model, best practices
- Stage Gates – predetermined kill decision points
- Annual Portfolio Review

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Conclusions

- Threshold for essential R&D activity varies by industry - but is universally closer to 1% of revenues than 0.01% of revenues
- Money is not enough -

Purpose Clarity - What are we trying to accomplish must be known

Choice Clarity - Good choices require metrics - why is B more important than A?

Systems Clarity - “Management” requires systems - Brownian motion does not good research make

Disciplined R&D = \$000 Millions in Value

Emulated by Industry Peers

- Southern California Edison



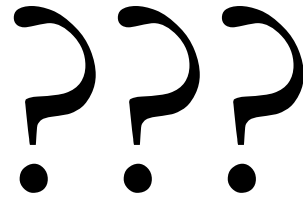
- First Energy



- Ameren



Questions



Contact Info:

Terry Oliver

Chief Technology Innovation Officer

Bonneville Power Administration

503.230.5853

tvoliver@bpa.gov